

Claims

1. A method for the patterned coating of a substrate (1) having at least one surface (2) which is to be coated, comprising the steps of:
- producing at least one negatively patterned first coating (3, 31, 32) on the at least one surface (2),
  - depositing at least one second layer (7, 71, 72, 73), which comprises an evaporation-coating glass, on the surface (2) which has been provided with the first coating (3, 31, 32),
  - at least partially removing the first coating (3, 31, 32).
2. The method as claimed in claim 1, wherein the step of producing a negatively patterned first coating (3, 31, 32) on the at least one surface (2) comprises the step of uncovering regions (6) of the at least one surface (2) which is to be coated.
3. The method as claimed in claim 1 or 2, wherein the substrate (1) is part of a wafer and the method is carried out while the substrate is still part of the wafer assembly.
4. The method as claimed in one of claims 1 to 3, in which the step of depositing a second layer (7, 71, 72, 73), which comprises an evaporation-coating glass, comprises the step of deposition by evaporation coating.
5. The method as claimed in claim 4, wherein the deposition of a layer by evaporation coating comprises the step of plasma ion-enhanced evaporation coating.

6. The method as claimed in claim 4 or 5, wherein the evaporation coating comprises the step of electron beam evaporation.

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7. The method as claimed in one of claims 4 to 6, wherein the step of evaporation coating of a layer which comprises an evaporation-coating glass comprises the step of evaporation of evaporation-coating material, which forms a material with a vitreous structure which has been deposited on the surface (2), from a single source.

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8. The method as claimed in one of claims 4 to 7, wherein the step of evaporation coating of a layer which comprises an evaporation-coating glass comprises the step of co-evaporation from at least two sources.

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9. The method as claimed in one of claims 1 to 8, wherein the step of depositing a second layer (7, 71, 72) which comprises an evaporation-coating glass comprises the step of depositing a layer with a composition which varies in a direction perpendicular to the surface.

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10. The method as claimed in one of claims 1 to 9, wherein the step of depositing a second layer (7, 71, 72, 73) which comprises an evaporation-coating glass comprises the step of sputtering on a layer (7, 71, 72, 73).

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11. The method as claimed in one of claims 1 to 10, wherein the step of depositing a second layer (7, 71, 72, 73) which comprises an evaporation-coating glass comprises the step of depositing a layer (7, 71, 72, 73) by means of CVD.

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12. The method as claimed in one of claims 1 to 11,  
wherein the step of depositing a second layer (7, 71,  
72, 73) which comprises an evaporation-coating glass  
5 comprises the step of depositing a layer (7, 71, 72,  
73) which includes an at least binary materials  
system.
13. The method as claimed in one of claims 1 to 12,  
10 wherein the step of depositing a second layer (7, 71,  
72, 73) which comprises an evaporation-coating glass  
comprises the step of co-deposition of organic  
material.
14. The method as claimed in one of claims 1 to 13,  
15 wherein the step of producing a negatively patterned  
first coating (3, 31, 32) comprises the step of  
resist-coating, in particular of resist-coating by  
means of spin-coating and/or spraying and/or the  
20 electrodeposition of a first coating (3, 31, 32).
15. The method as claimed in one of claims 1 to 14,  
wherein the step of producing a negatively patterned  
first coating (3, 31, 32) comprises the step of  
25 embossing a first coating (3, 31, 32).
16. The method as claimed in one of claims 1 to 15,  
wherein the step of producing a negatively patterned  
first coating (3, 31, 32) comprises the step of  
30 applying a photoresist film.
17. The method as claimed in one of claims 1 to 16,  
wherein the step of producing a negatively patterned  
first coating (3, 31, 32) comprises the step of  
35 patterned printing on of a first coating (3, 31, 32),

in particular of patterned printing on by means of screen printing.

5 18. The method as claimed in one of claims 1 to 17, wherein the step of producing a negatively patterned first coating (3, 31, 32) comprises the step of lithographic patterning of the first coating (3, 31, 32) and/or the step of lithographic grey scale patterning.

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19. The method as claimed in one of claims 1 to 18, wherein the step of producing a negatively patterned first coating (3, 31, 32) on the at least one surface (2) comprises the step of applying a photopatternable layer (3, 31, 32).

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20. The method as claimed in claim 19, wherein the step of applying a photopatternable layer (3, 31, 32) comprises the step of applying a photoresist.

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21. The method as claimed in one of claims 1 to 20, wherein the step of at least partially removing the first coating (3, 31, 32) comprises the step of dissolving the coating (3, 31, 32) in a solvent.

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22. The method as claimed in one of claims 1 to 21, wherein the step of at least partially removing the first coating (3, 31, 32) comprises the step of wet-chemical removal of the coating.

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23. The method as claimed in one of claims 1 to 22, wherein the step of at least partially removing the first coating (3, 31, 32) comprises the step of dry-chemical removal of the coating (3, 31, 32), in

particular the step of burning the first coating in an oxidizing plasma.

5        24. The method as claimed in one of claims 1 to 23, wherein the step of at least partially removing the first coating (3, 31, 32) comprises the step of lifting off regions of the at least one second layer (7, 71, 72, 73).

10      25. The method as claimed in one of claims 1 to 24, which includes the step of at least partially uncovering the first coating (3, 31, 32).

15      26. The method as claimed in claim 25, wherein the step of at least partially uncovering the first coating (3, 31, 32) comprises the step of planarizing the coated surface.

20      27. The method as claimed in claim 25 or 26, wherein the step of partially uncovering the first coating (3, 31, 32) comprises the step of mechanical abrasion, in particular by means of grinding and/or lapping and/or polishing.

25      28. The method as claimed in one of claims 1 to 27, which includes the step of aftertreatment of the positively patterned second layer, in particular by means of wet-chemical and/or dry-chemical and/or thermal reflow and/or doping.

30      29. The method as claimed in one of claims 1 to 28, wherein the steps of producing a negatively patterned first coating (3, 31, 32) on the at least one surface (2) and of depositing at least one second layer (7,

71, 72, 73) which comprises an evaporation-coating glass are carried out repeatedly.

- 5        30. The method as claimed in one of claims 1 to 29, which includes the step of joining the substrate (1) to a further substrate (25), in particular a semiconductor component and/or an optoelectronic component and/or a micro-electromechanical component.
- 10      31. The method as claimed in one of claims 1 to 30, wherein the method is used to define at least one phase grating and/or at least one optical component and/or at least one channel (40) and/or at least one waveguide (93, 94) in the second layer (7, 71, 72)  
15      which comprises an evaporation-coating glass.
- 20      32. The method as claimed in one of claims 1 to 31, which includes the step of at least partially filling structures of the second layer which comprises an evaporation-coating glass, in particular of filling them with conductive material and/or a transparent material (29).
- 25      33. The method as claimed in one of claims 1 to 32, which includes the step of applying at least one conductive region, in particular an interconnect (19), to the surface of the substrate and/or of the at least one second layer (7, 71, 72, 73).
- 30      34. The method as claimed in claim 32 or 33, wherein the step of filling structures in the second layer and/or the step of applying at least one conductive region comprises the step of producing at least one passive electronic component, in particular a capacitor and/or  
35      a resistor and/or an inductance.

35. The method as claimed in one of claims 1 to 34,  
wherein the substrate has at least two surfaces (2, 4)  
which are to be coated and which in particular lie on  
substantially opposite sides, in which the step  
- of producing at least one negatively patterned  
first coating (3, 31, 32) on the at least one surface  
(2),  
- of depositing at least one second layer (7, 71,  
72, 73), which comprises an evaporation-coating glass,  
on the surface (2) which has been provided with the  
first coating (3, 31, 32), and of  
- at least partially removing the first coating (3,  
31, 32) are carried out on each of the surfaces (2,  
4).
36. The method as claimed in one of claims 1 to 35, which  
includes the step of applying a bonding layer to the  
second layer (7, 71, 72, 73), in particular a bonding  
layer which comprises a seed layer for a subsequent  
metallization and/or an adhesive layer.
37. A method for the patterned coating of a substrate (1)  
having at least one surface (2) which is to be coated,  
in particular as claimed in one of the preceding  
claims, wherein the substrate (1) is coated with an  
evaporation-coating glass through a mask.
38. The method as claimed in claim 37, wherein the mask is  
brought into contact with that surface (2) of the  
substrate (1) which is to be coated.
39. The method as claimed in claim 37 or 38, wherein the  
mask is joined to the surface which is to be coated.



40. The method as claimed in one of claims 37 to 39, wherein the mask is adhesively bonded to the substrate.

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41. A coated substrate, in particular which can be coated using the method as claimed in one of the preceding claims, and which on at least one side (2) has a patterned coating (7, 71, 72, 73, 74) which comprises an evaporation-coating glass.

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42. The coated substrate as claimed in claim 41, wherein the coating (7, 71, 72, 73, 74) is deposited on a negatively patterned first coating (3, 31, 32) on the at least one side (2), and the negatively patterned first coating (3, 31, 32) is at least partially removed.

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43. The coated substrate as claimed in claim 41 or 42, wherein the substrate (1) includes at least one electronic circuit arrangement, in particular an integrated electronic circuit arrangement and/or at least one optoelectronic circuit arrangement and/or at least one micro-electromechanical component.

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44. The coated substrate as claimed in one of claims 41 to 43, wherein the substrate (1) is joined to a component (23, 25) which includes at least one electronic circuit arrangement, in particular an integrated electronic circuit arrangement and/or at least one optoelectronic circuit arrangement and/or at least one micro-electromechanical component.

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45. The coated substrate as claimed in one of claims 41 to 44, wherein at least one channel (40) is defined by the patterned coating of the substrate.
- 5 46. The coated substrate as claimed in one of claims 41 to 45, wherein at least one cavity (21) is defined by the patterned coating.
- 10 47. The coated substrate as claimed in one of claims 41 to 46, wherein at least one cut-out (13) is defined by the patterned coating of the substrate.
- 15 48. The coated substrate as claimed in one of claims 41 to 47, wherein the patterned coating (7, 71, 72, 73) includes at least one interconnect (19) and/or at least one passive electronic component, in particular a capacitor and/or a resistor and/or an inductance.
- 20 49. The coated substrate as claimed in one of claims 41 to 48, wherein the patterned coating (7, 71, 72, 73) includes at least one waveguide (93, 94), in particular at least two waveguides (93, 94) which are coupled to one another.
- 25 50. The coated substrate as claimed in one of claims 41 to 49, which includes a multilayered patterned coating.
- 30 51. The coated substrate as claimed in one of claims 41 to 50, wherein the substrate (1) comprises a material which includes glass and/or metal and/or ceramic and/or plastic and/or a semiconductor, in particular silicon and/or gallium arsenide.
- 35 52. The coated substrate as claimed in one of claims 41 to 51, wherein the substrate has a patterned coating (7,

71, 72, 73, 74) which comprises an evaporation-coating glass on each of two in particular substantially opposite sides (2, 4).

- 5    53. A device for carrying out the method and/or for producing the coated substrate as claimed in one of the preceding claims.